(12) UK Patent Application (19) GB (11) 2 162 581 A

(43) Application published 5 Feb 1986

(21) Application No 8418315

(22) Date of filing 18 Jul 1984

(51) INT CL⁴
F04D 29/70 29/40 // A01D 33/08

(52) Domestic classification
F1C 104 607 FJ
A1F EH
U1S 1007 1278 A1F F1C

(56) Documents cited
None

(58) Field of search
F1C
F1T

(71) Applicants
Reed & Upton Limited (United Kingdom),
Bay Quarry Works, Barton Mills, Bury St. Edmunds, Suffolk,
Consort Machinery Limited (United Kingdom),
50 High Street, Soham, Ely, Cambridgeshire

(72) Inventor
Colin George Reed

(74) Agent and/or address for service
Keith W. Nash & Co., 90—92 Regent Street, Cambridge CB2 1DP

(54) Casings for fans in harvesters

(57) The fan has a circumferential casing wall formed by a flexible membrane 62 stretched over axially directed bars 64. To prevent debris build up on the inner surface at the circumferential wall, the membrane is periodically moved back and forth over the bars by rocking a frame which defines the outlet 38 of the fan. The ends of the membrane are attached to the top and bottom edges 68, 70 of the frame which is rocked by a double acting ram 76. The debris may be soil, separated from a potato crop by the harvester.

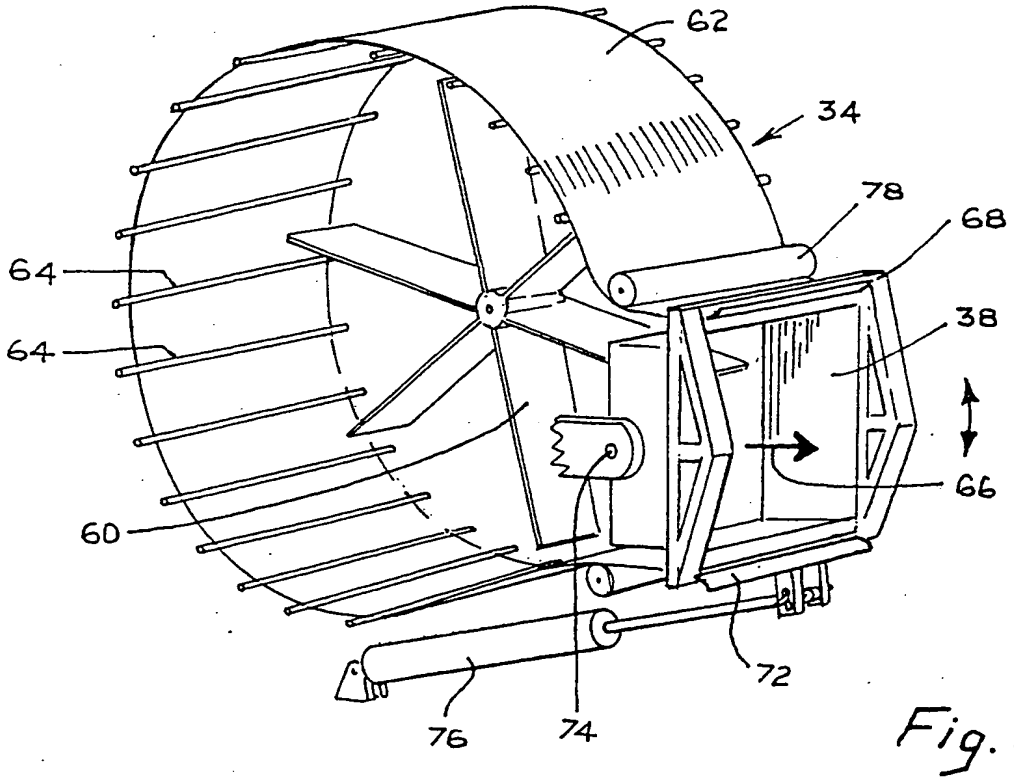

Fig. 3

GB 2 162 581 A

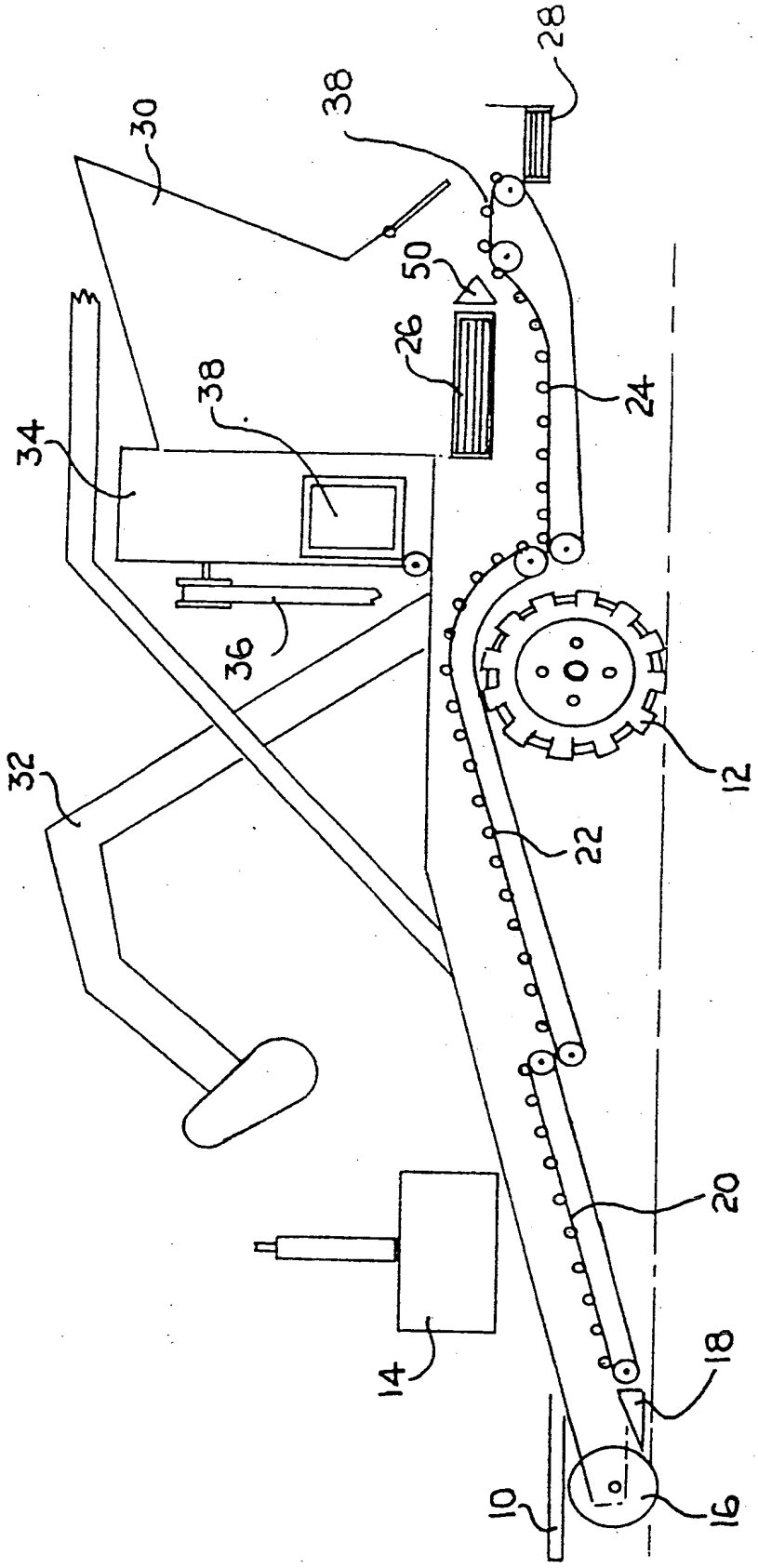

Fig. 1

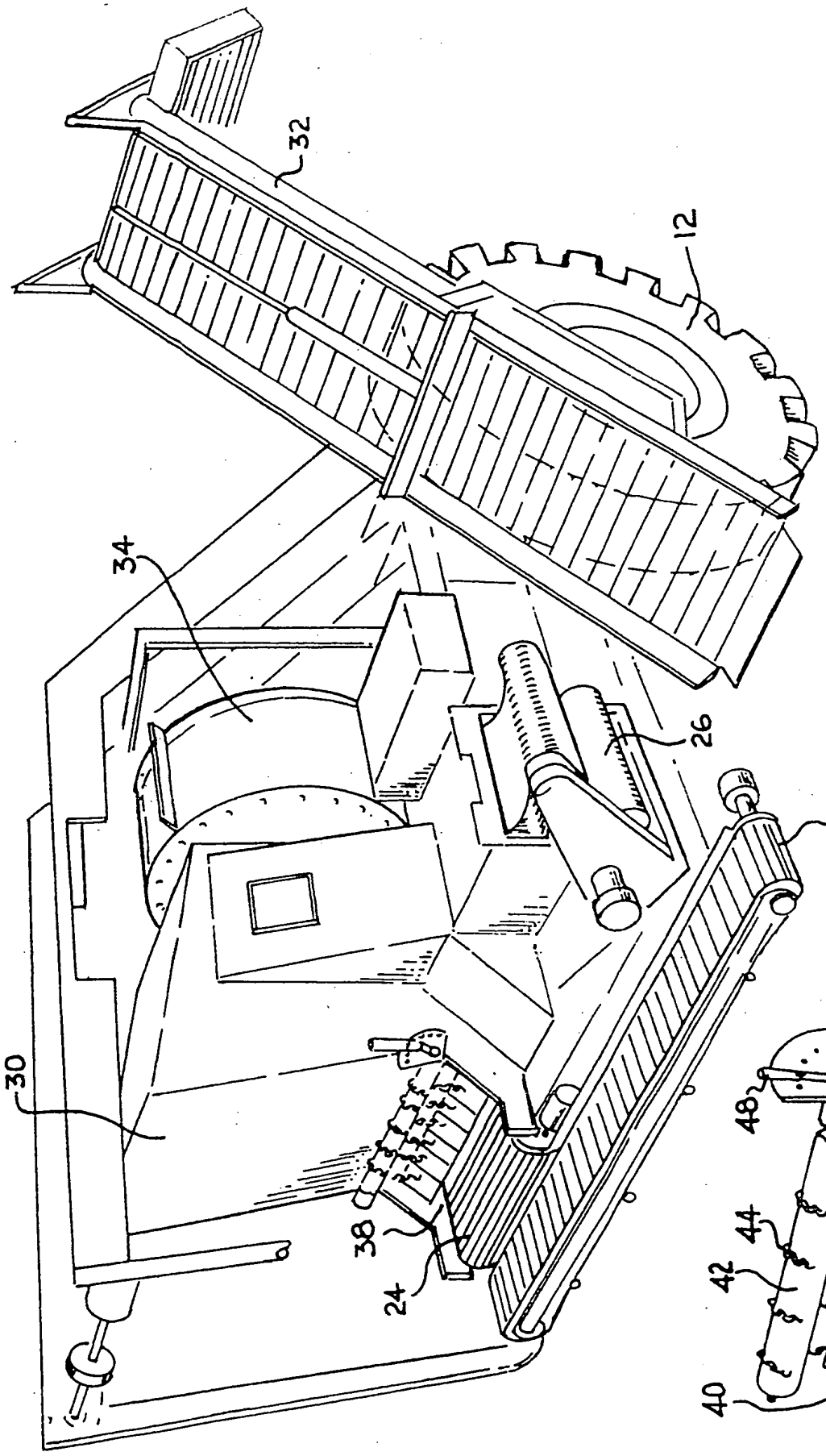

Fig. 2

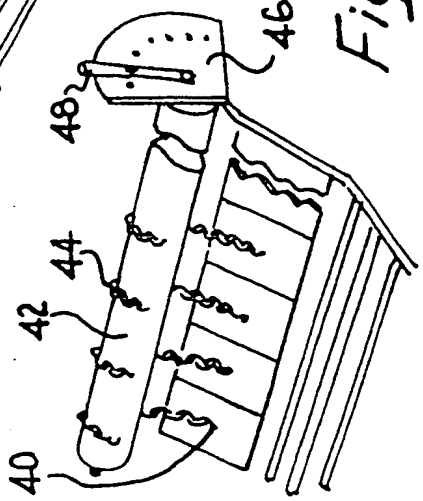

Fig. 2a

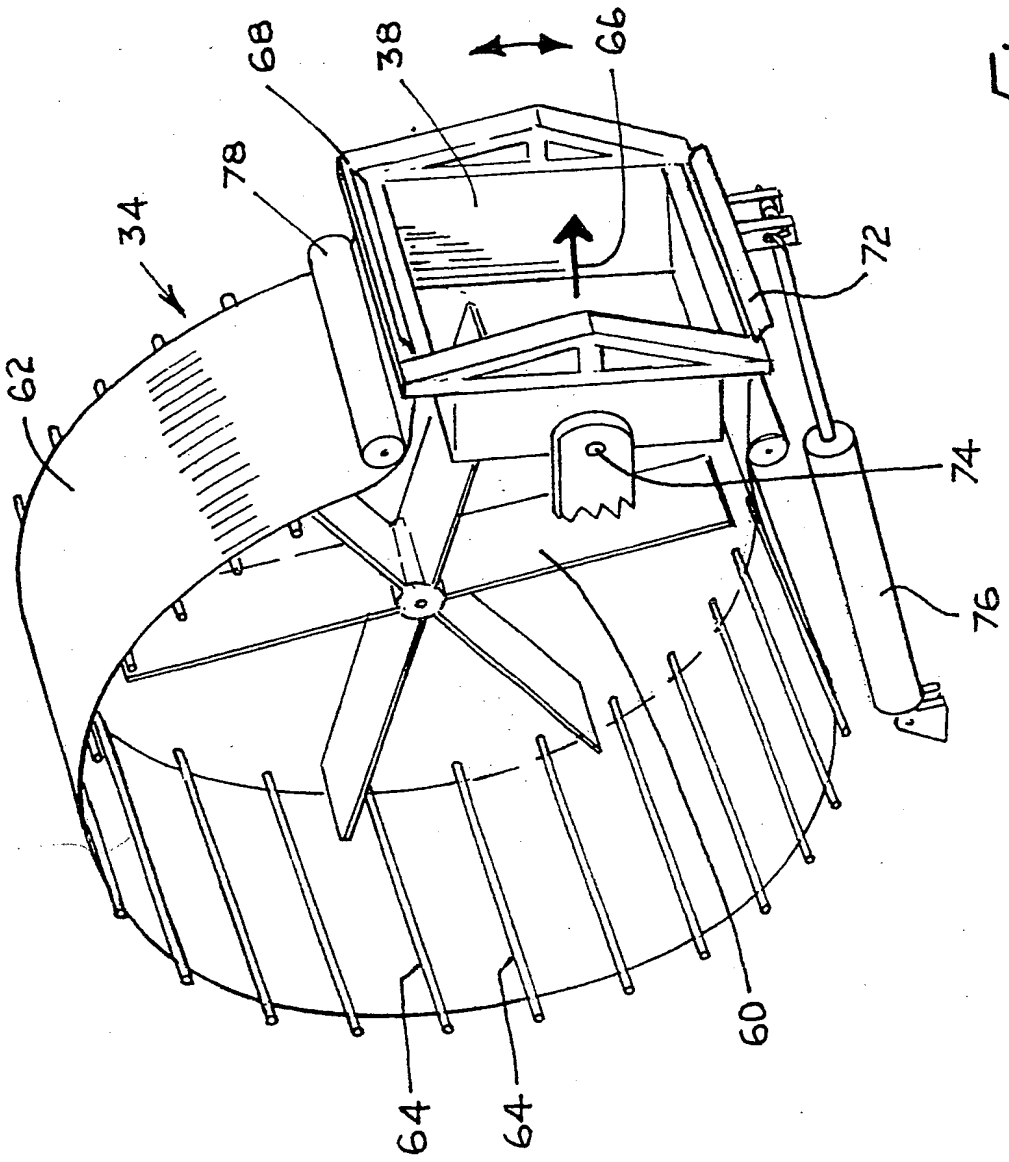

Fig. 3

SPECIFICATION

Fan casing

Description

This invention relates to a fan casing, for an axial-flow fan. The invention is particularly applicable to an axial-flow fan mounted in a casing which has a radial outlet. The invention can find application in many areas, including in crop harvesters where the crop is separated from unwanted debris by air separation.

Background to the Invention

An axial-flow fan conventionally operates within a generally cylindrical casing. When the fan is rotating, air is drawn through the blades, but there is inevitably a component of movement in a radial direction and in particular solid components in the air stream are diverted radially outwards and collect on the casing wall. This is particularly so if the casing wall includes a radial air outlet from the fan.

In harvesters for agricultural crops, the crop being harvested is often separated from unwanted components, ie soil and stones, by subjecting the mixture of crop, soil and stones to an air current which separates the components according to their density. Thus, the dense stones collect in one fraction, the medium density crop collects in another fraction and the lighter soil passes through to the fan (assuming the fan is creating a suction as is normally the case). The soil blown through the fan collects on the walls of the fan casing. This is undesirable because it restricts the flow through the fan and ultimately could interfere with the operation of the fan if not cleared away.

Summary of the Invention

According to the invention, there is provided a fan casing for an axial flow fan, the casing having a circumferential wall formed by a flexible membrane stretched around a framework formed by a plurality of fixed bars extending generally parallel to the fan axis, and means for sliding the membrane backwards and fowards over the bars.

When the membrane slides backwards and fowards over the bars, any build up of debris on the membrane will be scraped off by the bars. There will thus be no long-term build up of debris on the inside of the circumferential wall.

The circumferential wall may include a radial air outlet, and the membrane may extend from one side of this outlet, around the casing to the other side of the outlet.

The outlet may include a frame to which the ends of the membrane may be attached, and the frame may be mounted to perform reciprocating movement which will slide the membrane backwards and forwards around a circumferential path, over the bars of the framework.

In a preferred embodiment, the frame of the radial air outlet may be mounted for rocking movement about an axis between the slides to which the membrane is attached. The rocking movement may be actuated by a double-acting hydraulically operated ram. Where the casing has a radial air outlet, the casing can be completed by a backplate which is continuous and by a frontplate which has an air intake opening.

Brief Description of the Drawings

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a general schematic side view of a potato harvester incorporating a fan casing in accordance with the invention;

Figure 2 is a schematic perspective view from behind of the harvester of Figure 1; and

Figure 2a is a detailed view of an air gap and adjustment mechanism;

Figure 3 shows the fan and fan casing alone.

Description of a Preferred Embodiment

In the harvester of Figure 1, only those parts of the harvester which are necessary for an understanding of the invention are shown. The harvester has a drawbar 10 by which it can be coupled to a tractor, for towing on roadwheels 12. The harvester has its own power unit 14. Cutter discs 16 at the front end enter the ground and allow blades 18 to lift the crop. As the harvester advances, the crop is pushed back onto feed conveyors 20 and 22. These conveyors carry the crop on slats, so that some of the unwanted debris picked up with the crop can be dropped directly back on the ground. From the conveyor 22, the crop is passed onto a third feed conveyor 24 which passes beneath a product conveyor 26, and extends up to the location of a stone conveyor 28. The product conveyor 26 passes laterally through a separation chamber 30 where separation of the product from the unwanted stones and earth takes place.

Once the separation has taken place, the product on the conveyor 26 is passed to a final conveyor 32 and discharged to, for example, a truck travelling beside the harvester.

Separation takes place in an air current which is directed across the top of the end of the third feed conveyor 24. A fan in a casing 34 is driven by a drive mechanism 36 and sucks air into the separation chamber 30 through a gap 38. The width of this gap is adjustable, in a manner which will be described later to vary the air velocity in this gap.

The air sucked in forms a strong air current across the mat rial on the feed conveyor 24. The velocity of this air current will be chosen so the most dense material, ie stones, on the feed conveyor 24 are left on the conveyor. The medium density fraction, ie the crop such as potatoes or carrots are picked up by the air, together with the lighter fraction i.e. the earth.

As the air current moves further into the separation chamber 30, the large internal volume of the chamber causes the air velocity to drop suddenly thus depositing the crop on the product conveyor 26. The much lighter earth remains entrained in the air current and is drawn through the fan, passing out of the casing 34 through a fan outlet 39.

The stones which are picked off the feed conveyor 24 drop onto the stone conveyor 28, and are discharged from the harvester at a suitable place on ground which has already been harvested.

Figure 2 shows the exterior of the rear of the harvester and shows the relative positions of the third feed conveyor 24, the stone conveyor 28 and the fan casing 34. The product conveyor 26 extends through the bottom of the separation chamber 30 and therefore only one end of it can be seen. This figure also shows the final conveyor 32 which, in the Figure, is shown in its out of work position. In its in-work position, the conveyor 32 will be swung through 90° about a vertical axis so that the bottom end of the conveyor lies squarely beneath the outer end of the product conveyor 26. Crops or products falling from the conveyor 26 to the bottom of the conveyor 32 are then carried up the conveyor 32 and are discharged into a container travelling alongside the harvester.

The size of the air gap 38 is critical in determining the air velocity through the gap and thus determining the limits at which separation will occur. The upper edge of the gap is defined by a number of adjustable flaps 40 which hang from a bar 42 by chains 44. The flaps are restrained to prevent them being sucked into the chamber 30, by a suitable abutment placed behind them.

To adjust the gap, the bar 42 is rotated thus winding the chains up on the bar and raising the flaps. To reduce the gap, the opposite procedure is followed.

A quadrant plate 46 at one end of the bar 42 has a number of spaced holes which co-operate with a corresponding projection on the handle 48 so that the handle can be locked in any desired position.

Figure 1 also shows a separating strip 50 which is mounted alongside the product conveyor 26 and assists separation of the material on the feed conveyor 24 into a fraction which passes onto the top of the conveyor 26 and a fraction which remains on the feed conveyor 24 below.

Figure 3 shows the internal construction of the fan within its casing 34. A fan 60 rotates about a central axis and draws air in in an axial direction. Although it is not shown, the casing 34 will be closed by a plate which completely encloses one open end of the casing 34.

The peripheral or circumferential surface of the casing 34 is formed by a membrane 62 which will be of tough, impervious but flexible material. This membrane will be stretched around a number of bars 64 which are all fixed in place and together form part of the framework.

An air outlet 38 is formed in the peripheral casing wall. Air drawn into the casing 34 by the fan in an axial direction is thus diverted and discharged from the casing in a tangential direction, as indicated by the arrow 66.

One end of the membrane 62 is connected to the top edge 68 of a frame 70 which defines the outlet opening 38. The other end of the membrane 62 is attached to the bottom edge 72 of the frame 70.

To prevent build up of soil or other debris on the inside of the casing 34, the membrane 62 can be slid to and fro relative to the bars 64, so that the bars 64 scrape over the inner surface of the membrane and dislodge any deposit that has accumulated. This movement of the membrane 62 is accomplished by a tilting movement of the frame 70 which is mounted on an axis 74. A double acting ram 76 below the casing alternately pushes and pulls on the bottom edge 72 of the frame 70. The ends of the alternate pushing and pulling movements are determined by proximity detectors which indicate when the movement in each direction should be terminated and the motion reversed.

This action loosens any deposit on the inside of the membrane 62. The deposit will then again be entrained by the air passing through the fan and will be blown out of the outlet 38.

The membrane 62 will be tensioned around the bars 64. An additional tensioning roller 78 may be included on the outside of the belt to ensure that the necessary tension is maintained.

For efficient fan operation, it is important that the separation chamber 30 should be substantially sealed (apart from the air intake opening). Steps should be taken to provide seals between the chamber walls and the ends of the product conveyor 26 where these extend out of opposite sides of the casing, and a suitable closure arrangement is described in our co-pending application no. (our case C127/R) filed on the same day as the present application.

CLAIMS

1. A fan casing for an axial flow fan, the casing having a circumferential wall formed by a flexible membrane stretched around a framework formed by a plurality of fixed bars extending generally parallel to the fan axis, and means for moving the membrane backwards and fowards in a circumferential direction over the bars.

2. A fan casing as claimed in Claim 1, wherein the circumferential wall includes a radial air outlet, and the membrane extends from one side of this outlet, around the casing to the other side of the outlet.

3. A fan casing as claimed in Claim 2, wherein the outlet includes a frame to which the ends of the membrane are attached, and the frame is mounted to perform reciprocating movement which will slide the membrane backwards and fowards around a circumferential path, over the bars of the framework.

4. A fan casing as claimed in Claim 3, wherein the frame of the radial air outlet is mounted for rocking movement about an axis between the sides of the frame to which the membrane is attached.

5. A fan casing as claimed in Claim 4 wherein the rocking movement is actuated by a doubleacting hydraulically operated ram.

6. A fan casing as claimed in any preceding claim, which has a radial air outlet, a backplate which is continuous and a frontplate which has an air intake opening.

7. A fan casing substantially as herein described with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office by Courier Press, Leamington Spa. 2/1986. Demand No. 8817443.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.